REMARKS

Claims 1-46 are pending.

Claims 1-46 stand rejected.

Claims 1, 9, 17, 25, 33 and 41-46 have been amended.

Formal Matters

Certain amendments have been made to claims 1, 9, 17, 25, 33 and 41-46, in order to correct several informalities. These amendments add no new matter, and do not, nor are they intended to, limit the scope of any of the claims.

Rejection of Claims under 35 U.S.C. § 103

Claims 1-46 stand rejected under 35 U.S.C. § 103 as being unpatentable over Callon, U.S. Patent Application Publication No. 2002/0131362, and in view of Houji, U.S. Patent No. 5,832,197. Applicants respectfully traverse these rejections.

Applicants respectfully submit that Callon, even in light of Houji and/or the level of skill in the art at the time of invention, taken alone or in any permissible combination, fail to show, teach or suggest the claimed invention. For example, independent claim 1, as amended, reads as follows:

1. A method for restoring a path in a communication system between zones comprising:
establishing an inter-zone link between a first border node of a source zone and a second border node of a destination zone;
;
identifying a pre-planned alternative route, where the pre-planned alternative route meets class of service requirements between the source zone and the destination zone;
informing a node in the destination zone of the pre-planned alternative route;
informing a node in the source zone of the pre-planned alternative route; and
providing communication between the destination zone and the source zone via the pre-planned alternative route.

The Office Action cites Callon as teaching the first two limitations, while Houji is cited as teaching the remaining four limitations. Office Action, pp. 3-4, para. 5. In particular, Callon, paras. 30-37 are cited as teaching "identifying an inter-zone link failure between the source zone and the destination zone":

[0030] FIG. 2 illustrates a group of autonomous systems (AS's) 12A-12J forming a computing network 10. Each AS includes at least one router, illustrated in FIG.2 as routers 4A-4J. Each AS 12A-12J uses a border protocol, such as BGP, to communicate with neighboring autonomous systems. Specifically, each of

autonomous system 12A-12J includes at least one router that uses an external border protocol to share routing information with neighboring autonomous systems 12. Routers 4A-4J may use an internal border protocol, such as internal BGP (IBGP), to exchange routing information within the same autonomous system. In some embodiment, IBGP may be used within an autonomous system to carry external routing and path information, while a separate routing protocol, such as OSPF, IS-IS or RIP, may be used to carry internal routing and path information.

[0031] To illustrate the potential for delay in convergence of routing information, consider the routing of data packets from AS 12J to AS 12B. Router 4J maintains a routing table that describes valid routes to AS 12B. To forward a data packet to AS 12B, router 4J retrieves the "best" route from its routing table that identifies AS 12B as the destination. For example, the routing table of router 4J may include the following route: {12F, 12D 12B}, where 12F is the "next hop" from router 4J.

[0032] **In the event of a link failure, such as link 8, router 4D may broadcast an update message instructing neighboring autonomous systems to withdraw route {12D, 12B} from their routing tables. This message causes neighboring autonomous systems to generate update messages, until router 4J eventually receives one or more update messages from each of neighboring autonomous system 12G, 12F and 121 over a period of time. For example, AS 12F may issue an update message withdrawing route {12F, 12D, 12B}.**

[0033] Router 4J may, however, select paths that are unavailable until convergence of its routing table. For example, if router 4J receives an update message from router 12F withdrawing route {12F, 12D, 12B} before receiving an update message from 12G, it may try to use path {12G, 12D, 12B} to reach AS 12B until router 4J receives a BGP update message withdrawing this path. Even then, router 4J may then select path {121, 12F, 12D, 12B} **until a corresponding BGP update message is received withdrawing this path. In each case, the selected route includes failed link 8.**

[0034] This problem may be compounded by the fact that intermediate routers may similarly be misled. **For example, router 4F may receive an update message from router 4D prior to receiving any update message from router 4E.** This may cause router 4F to assume that path {4E, 4D, 4B} is available. Routing table oscillations within intermediate routers may cause extended oscillation at routers farther removed from failed link 8, such as router 4J. Thus, under conventional path vector routing protocols, routing tables may oscillate over a considerable period of time, and packets may be incorrectly forwarded, based on the order and propagation delays of update messages as they flood outward from the failed link.

[0035] In order to reduce the time to convergence to a stable state consistent the principles of the invention **router 4D issues link failure messages in addition to the conventional update messages upon detecting failure of link 8**. Unlike a conventional update message that may simply indicate destination 12B is unreachable, the link failure message uniquely identifies link 8 as a failed link. Once router 4J receives the link failure message, router 4J does not attempt

to use routes that include the failed link 8 during the "valid period" for the link failure information. Furthermore, router 4J ignores any update messages that advertise an available route that includes failed link 8. Thus, the link failure information describes the root of the problem, the failed link, and not just symptoms of the problem, invalid paths. Once a router receives and forwards the link failure message, the router does not re-forward the message, or any update messages that lists link 8 to its neighbors, thereby reducing the number of update messages that may otherwise flood network 10. As described in detail below, router 4J stores the link failure information for the "storage period" for the link failure information, and then automatically deletes the information, thereby treating link 8 as restored.

[0036] FIG. 3 is a block diagram illustrating an example router 4A configured consistent with the principles of the invention. Router 4A includes one or more interface cards (IFC's) 13 for interfacing with network links 14, 16. Control unit 15 implements a path vector routing algorithm to route inbound packets received from inbound link 14 to the appropriate outbound link 16. Control unit 15 stores path vector routing information in routing table 18 and link failure information in link failure data store 17. In general, control unit 15 represents any unit that routes packets in accordance with a routing table. In one embodiment, control unit 15 may comprise a forwarding engine that analyzes routing table 18 prior to receiving packets and generates a forwarding table that includes only those routes to be used to forward the packets.

[0037] Link failure data store 17 may comprise different forms including a table of link failure messages, a flat file stored on a storage medium, or even a

database. Upon receiving an inbound packet, control unit 15 examines header information within the packet to identify the destination of the packet. Based on the destination, control unit 15 selects an available route, and forwards the packet to one of the IFC's 13, based on the routing information within routing table 16 and the link failure information within link failure message store 17. (Emphasis supplied)

As can be seen in the preceding passage, specifically with regard to the bolded passages in paragraphs 32-35, Callon's system is based on the sending of messages to update the routing information maintained by each router. This results in a number of effects, including a significant rise in network traffic and increased consumption of router resources. In fact, if a link fails in Callon, nodes within each of Callon's networks may be drawn into the process of taking the failed link out of service. This is recognized in Callon, which attempts to minimize the impact of such processes by limiting the broadcast of such messages. (paras. 30-37) This is reflected in Callon's Abstract:

Link failure messages are sent through a network to accelerate convergence of routing information after a network fault. The link failure messages reduce the oscillations in routing information stored by routers, which otherwise can cause significant problems, including intermittent loss of network connectivity as well as increased packet loss and latency. For example, the link failure messages reduce the time that a network using a path vector routing protocol, such as the Border Gateway Protocol (BGP), takes to converge to a

> stable state. More particularly, upon detecting a network fault, a router generates link failure information to identify the specific link that has failed. In some types of systems, the router communicates the link failure information to neighboring routers as well as a conventional update message withdrawing any unavailable routes. Once other routers receive the link failure information, the routers do not attempt to use routes that include the failed link. (Emphasis supplied)

As can be seen, the focus of Callon is the use of link failure messages to improve the response of the network to a failure in the event of a network fault.

By contrast, the claimed invention is directed to restoring a path in a communication system in the inter-zone realm (i.e., that portion of the network between zones). The inventors came to the realization that a failure in such circumstances using a method such as that propounded by Callon would result in a large amount of overhead that, in the given circumstance, was (and is) unnecessary. However, given that the failure contemplated in the application of the claimed invention is inter-zone, the inventors also realized that a pre-planned alternative route could be employed to provide fast, efficient restoration of failed inter-zone links. Such a restoration method allows for fast restoration by providing a pre-planned alternative route, thereby minimizing the time needed to identify and begin using the alternative route. Moreover, the inventors recognized that such a technique could be used because the number of links and nodes (respectively, inter-zone links and border nodes) is typically small enough to make the claimed techniques manageable. Moreover, by using such an approach, networks according to the claimed invention could restrict the method of restoration used within a given zone, to the zone in which a failure occurred.

By definition, then, Callon fails to show, teach or suggest the claimed invention, and, in fact, presents a solution diametrically opposed to that of the claimed invention. Moreover, as correctly noted in the Office Action (Office Action, p. 3, para.4), Callon is also silent on the remaining limitations of the independent claims. For example, in amended claim 1, Callon fails to show, teach or suggest:

> "...
> identifying a pre-planned alternative route, where the pre-planned alternative route meets class of service requirements between the source zone and the destination zone;
> informing a node in the destination zone of the pre-planned alternative route;
> informing a node in the source zone of the pre-planned alternative route; and
> providing communication between the destination zone and the source zone via the pre-planned alternative route."

Unfortunately, though not unexpectedly, Houji fails to remedy these infirmities. Houji is directed to:

> "... a connection-oriented network, [in which] a source network node responds to a connection request from a source user by sending signaling messages to adjacent nodes to request reservation of multiple paths by specifying a QOS parameter of minimum level and then establishes to a destination node if the requests are accepted. The source network node selects one of the established paths and sends a second signaling message to the node of the selected path, requesting that the QOS parameter of the selected path be increased from the minimum level to a level specified by the connection request, and establishes a

connection from the source user to a destination user via the selected path if the second signaling message is accepted by the node of the selected path. If a link failure occurs in the selected path, a protection switching routine is performed by the source node by selecting one of the paths available and sending a third signaling message to the node of the selected path, requesting an increase of the QOS parameter of the selected path to the user-specified level. If the third signaling message is accepted, the source node reestablishes the connection via the selected path. When the failed path is restored, a fault recovery routine begins by sending a fourth signaling message from the source node to the node of the restored path, requesting reservation of the restored path by specifying the QOS parameter of the minimum level. If the fourth signaling message is accepted, the restored path is reestablished. If a session is not restarted between the source and destination users, the protection switching is repeated. (Abstract)

As can be seen, Houji presents a number of infirmities with regard to the obviousness of the claimed invention. First and foremost, Houji fails to remedy Callon's failure to provide a pre-planned alternative route between zones, and in failing in this regard, likewise fails to recognize one of the primary advantages of the claimed invention by employing the claimed restoration method in the inter-zone setting. Houji, as Callon, makes no distinction between different portions of its network with regard to the method of restoration (nor the possibility that different methods might be used in such portions), and in so doing, fails to remedy Callon's failure to show, teach or suggest the identification of a pre-planned alternative route between zones or the use thereof.

Furthermore, as with Callon, Houji fails to recognize the possibility of a network structure even remotely comparable to a the multiple zones of the claimed invention. By contrast, Houji is concerned with the establishment of a connection in a connection oriented network. (col. 1, line 33, to col. 2, line 31) Regardless of Houji's treatment of QoS, this basic failing precludes any reading of Houji such that the claims could be said to read thereon.

This failure leads to the further conclusion that one of skill in the art would not have been motivated to combine the disclosures of Callon and Houji based on any such ostensible suggestion in their disclosure or the level of skill in the art at the time of invention. In this regard, the Office Action states that such motivation is provided by:

> "... the pre-planned alternative route meets class of service requirements between the source zone and the adjacent destination zone because this feature performs alternate routing and avoids congestion without interrupting a connection ... [and] in order to select one of the alternate virtual paths according to their priorities and switches the route to the selected virtual path without interrupting the connection ... ."

The preceding reasoning is flawed in several regards. First, the ability to switch to another path without interrupting the connection is not recited in the claims. Moreover, nowhere in the cited portions of either reference, or elsewhere therein, are Applicants able to discern any treatment of the issue of network congestion. And once again, such issues appear nowhere in the present application's claims.

Second, there is nothing in either reference (nor, in fact, in the skill in the art at the time of invention) that shows, teaches or even suggests that Houji's restoration would be particularly desirable in the setting described in Callon. To suggest otherwise would be to use the Applicants' claims as a blueprint for such a rejection, and so employ impermissible hindsight.

In fact, Applicants respectfully submit that Callon is oblivious to any need for Houji's techniques that might arguably exist therein, and provides no showing, teaching or suggestion that one of skill in the art should look elsewhere for other restoration techniques. Callon is quite self-contained in this regard. Conversely, Houji is similarly self-contained, providing a standalone restoration technique that would find no benefit from Callon that would be particularly applicable to Houji's disclosed restoration technique.

In fact, given that Callon already provides a method of identifying failed routes and the re-routing of network traffic over (remaining) operational links, Applicants further respectfully assert that the inclusion of Houji's restoration techniques would simply be cumulative to those techniques already taught by Callon. Conversely, once again, the application of Callon to Houji would be similarly cumulative. Thus, not only is there no motivation to combine the disclosures of Callon and Houji, even if combined, their combination would not only fail to make obvious the claimed invention, but would fail to provide any particular benefit over their disclosures taken separately.

In this regard, such a combination would theoretically provide a system that would employ Callon's link failure messages to accelerate convergence of routing information after a network fault. but would also support Houji's reservation of multiple paths, and Houji's switching to another of the paths in case of a failure of a first one of the paths. These two techniques would seem at odds with one another, and in any case, fail to show, teach or suggest the claimed invention.

As to the compatibility of the two techniques, Applicants respectfully assert that Houji's switching have no need to Callon's link failure messages. Once a failure is detected in Houji, Houji switches to another of the reserved paths. Sending link failure messages would not provide any benefit. Conversely, once Callon's link failure messages are sent, simply switching to another path precludes the effect of having sent such link failure messages. Two perform both operations would no doubt cause problems, given that some nodes would be re-routing network traffic based on Callon's link failure messages, while others (those along the selected one of Houji's reserved paths) would simply proceed with sending network traffic over the selected one of Houji's reserved paths. As will be appreciated, this would likely lead to inefficiencies, and possibly errors, within the network.

However, regardless of the deleterious effects of such a combination on a network's operation, the fundamental infirmity of such a combination in the present context is that such a combination fails to make obvious the claimed invention. Callon and Houji, in any permissible combination, do not provide a method or apparatus capable of restoring a path in a communication system between zones, in the manner of the claimed invention. As a result of the architecture of the claimed network and the claimed invention's features, the claimed invention is able to provide a pre-planned alternative route that can be used in the event of a failure of an inter-zone link. Such functionality is simply not shown, taught or suggested by the references or their combination.

In light of the foregoing arguments, the combination of Callon and Houji, even in light of skill in the art (which Applicants maintain is neither appropriate nor properly defined in the Office Action), fail to make obvious the claimed invention, as claimed in independent claims 1, 9, 17, 25, 33, 41, 44 and 46. Moreover, Applicant respectfully asserts that claims 2-8, 10-16, 18-

24, 26-32, 34-40, 42-43 and 45, which depend variously from independent claims 1, 9, 17, 25, 33, 41, 44 and 46, are also allowable, for at least the foregoing reasons.

CONCLUSION

Applicant submits that all claims are now in condition for allowance, and an early notice to that effect is earnestly solicited. Nonetheless, should any issues remain that might be subject to resolution through a telephonic interview, the Examiner is invited to telephone the undersigned.

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